

JC560 U.S. PTO  
12/11/98

Practitioner's Docket No. ATUS 4630

**PATENT**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Box Patent Application  
Assistant Commissioner for Patents  
Washington, D.C. 20231

**NEW APPLICATION TRANSMITTAL**

Transmitted herewith for filing is the patent application of

Inventor(s): Michael Bayer

**WARNING:** 37 C.F.R. § 1.41(a)(1) points out:

"(a) A patent is applied for in the name or names of the actual inventor or inventors.

"(1) The inventorship of a nonprovisional application is that inventorship set forth in the oath or declaration as prescribed by § 1.63, except as provided for in § 1.53(d)(4) and § 1.63(d). If an oath or declaration as prescribed by § 1.63 is not filed during the pendency of a nonprovisional application, the inventorship is that inventorship set forth in the application papers filed pursuant to § 1.53(b), unless a petition under this paragraph accompanied by the fee set forth in § 1.17(f) is filed supplying or changing the name or names of the inventor or inventors."

For (title):

**Electrical Connector for Connection Between Coil and Printed  
Circuit Board in Automotive Anti-Lock Braking System**

**CERTIFICATION UNDER 37 C.F.R. 1.10\***

(Express Mail label number is mandatory.)

(Express Mail certification is optional.)

I hereby certify that this New Application Transmittal and the documents referred to as attached therein are being deposited with the United States Postal Service on this date 12/11/98, in an envelope as "Express Mail Post Office to Addressee," mailing Label Number EL134825367US, addressed to the: Assistant Commissioner for Patents, Washington, D.C. 20231.

Joyce Krumpe

(type or print name of person mailing paper)

Joyce Krumpe  
Signature of person mailing paper

**WARNING:** Certificate of mailing (first class) or facsimile transmission procedures of 37 C.F.R. 1.8 cannot be used to obtain a date of mailing or transmission for this correspondence.

**\*WARNING:** Each paper or fee filed by "Express Mail" **must** have the number of the "Express Mail" mailing label placed thereon prior to mailing. 37 C.F.R. 1.10(b).

"Since the filing of correspondence under § 1.10 without the Express Mail mailing label thereon is an oversight that can be avoided by the exercise of reasonable care, requests for waiver of this requirement will **not** be granted on petition." Notice of Oct. 24, 1996, 60 Fed. Reg. 56,439, at 56,442.

## 1. Type of Application

This new application is for a(n)

(check one applicable item below)

- ☒ Original (nonprovisional)  
☐ Design  
☐ Plant

**WARNING:** Do not use this transmittal for a completion in the U.S. of an International Application under 35 U.S.C. 371(c)(4), unless the International Application is being filed as a divisional, continuation or continuation-in-part application.

**WARNING:** Do not use this transmittal for the filing of a provisional application.

**NOTE:** If one of the following 3 items apply, then complete and attach **ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF A PRIOR U.S. APPLICATION CLAIMED** and a **NOTIFICATION IN PARENT APPLICATION OF THE FILING OF THIS CONTINUATION APPLICATION**.

- ☐ Divisional.  
☐ Continuation.  
☐ Continuation-in-part (C-I-P).

## 2. Benefit of Prior U.S. Application(s) (35 U.S.C. 119(e), 120, or 121)

**NOTE:** A nonprovisional application may claim an invention disclosed in one or more prior filed copending nonprovisional applications or copending international applications designating the United States of America. In order for a nonprovisional application to claim the benefit of a prior filed copending nonprovisional application or copending international application designating the United States of America, each prior application must name as an inventor at least one inventor named in the later filed nonprovisional application and disclose the named inventor's invention claimed in at least one claim of the later filed nonprovisional application in the manner provided by the first paragraph of 35 U.S.C. 112. Each prior application must also be:

(i) An international application entitled to a filing date in accordance with PCT Article 11 and designating the United States of America; or

(ii) Complete as set forth in § 1.51(b); or

(iii) Entitled to a filing date as set forth in § 1.53(b) or § 1.53(d) and include the basic filing fee set forth in § 1.16; or

(iv) Entitled to a filing date as set forth in § 1.53(b) and have paid therein the processing and retention fee set forth in § 1.21(f) within the time period set forth in § 1.53(f).

37 C.F.R. § 1.78(a)(1).

**NOTE:** If the new application being transmitted is a divisional, continuation or a continuation-in-part of a parent case, or where the parent case is an International Application which designated the U.S., or benefit of a prior provisional application is claimed, then check the following item and complete and attach **ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED**.

**WARNING:** If an application claims the benefit of the filing date of an earlier filed application under 35 U.S.C. 120, 121 or 365(c), the 20-year term of that application will be based upon the filing date of the earliest U.S. application that the application makes reference to under 35 U.S.C. 120, 121 or 365(c). (35 U.S.C. 154(a)(2) does not take into account, for the determination of the patent term, any application on which priority is claimed under 35 U.S.C. 119, 365(a) or 365(b).) For a c-i-p application, applicant should review whether any claim in the patent that will issue is supported by an earlier application and, if not, the applicant should consider canceling the reference to the earlier filed application. The term of a patent is not based on a claim-by-claim approach. See Notice of April 14, 1995, 60 Fed. Reg. 20,195, at 20,205.

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**WARNING:** When the last day of pendency of a provisional application falls on a Saturday, Sunday, or Federal holiday within the District of Columbia, any nonprovisional application claiming benefit of the provisional application must be filed prior to the Saturday, Sunday, or Federal holiday within the District of Columbia. See 37 C.F.R. § 1.78(a)(3).

- ☐ The new application being transmitted claims the benefit of prior U.S. application(s). Enclosed are ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED.

### 3. Papers Enclosed

- A. Required for filing date under 37 C.F.R. § 1.53(b) (Regular) or 37 C.F.R. § 1.153 (Design) Application

5 Pages of specification

2 Pages of claims

3 Sheets of drawing

☐ formal

☒ informal

- B. Other Papers Enclosed

1 Pages of Abstract

     Other

**WARNING:** *DO NOT* submit original drawings. A high quality copy of the drawings should be supplied when filing a patent application. The drawings that are submitted to the Office must be on strong, white, smooth, and non-shiny paper and meet the standards according to § 1.84. If corrections to the drawings are necessary, they should be made to the original drawing and a high-quality copy of the corrected original drawing then submitted to the Office. Only one copy is required or desired. For comments on proposed then-new 37 CFR 1.84, see Notice of March 9, 1988 (1990 O.G. 57-62).

**NOTE:** "Identifying indicia, if provided, should include the application number or the title of the invention, inventor's name, docket number (if any), and the name and telephone number of a person to call if the Office is unable to match the drawings to the proper application. This information should be placed on the back of each sheet of drawing a minimum distance of 1.5 cm. (5/8 inch) down from the top of the page . . ." 37 C.F.R. 1.84(c)).

(complete the following, if applicable)

- ☐ The enclosed drawing(s) are photograph(s), and there is also attached a "PETITION TO ACCEPT PHOTOGRAPH(S) AS DRAWING(S)." 37 C.F.R. 1.84(b).

### 4. Additional papers enclosed

- ☐ Preliminary Amendment
- ☐ Information Disclosure Statement (37 C.F.R. 1.98)
- ☐ Form PTO-1449 (PTO/SB/08A and 08B)
- ☐ Citations
- ☐ Declaration of Biological Deposit
- ☐ Submission of "Sequence Listing," computer readable copy and/or amendment pertaining thereto for biotechnology invention containing nucleotide and/or amino acid sequence.
- ☐ Authorization of Attorney(s) to Accept and Follow Instructions from Representative
- ☐ Special Comments
- ☐ Other

## 5. Declaration or oath

**NOTE:** A newly executed declaration is not required in a continuation or divisional application provided that the prior nonprovisional application contained a declaration as required, the application being filed is by all or fewer than all the inventors named in the prior application, there is no new matter in the application being filed, and a copy of the executed declaration filed in the prior application (showing the signature or an indication thereon that it was signed) is submitted. The copy must be accompanied by a statement requesting deletion of the names of person(s) who are not inventors of the application being filed. If the declaration in the prior application was filed under § 1.47, then a copy of that declaration must be filed accompanied by a copy of the decision granting § 1.47 status or, if a nonsigning person under § 1.47 has subsequently joined in a prior application, then a copy of the subsequently executed declaration must be filed. See 37 C.F.R. §§ 1.63(d).

☒ Enclosed

Executed by

(check all applicable boxes)

☒ inventor(s).

☐ legal representative of inventor(s).  
37 CFR 1.42 or 1.43.

☐ joint inventor or person showing a proprietary interest on behalf of inventor who refused to sign or cannot be reached.

☐ This is the petition required by 37 CFR 1.47 and the statement required by 37 CFR 1.47 is also attached. See item 13 below for fee.

☐ Not Enclosed.

**NOTE:** Where the filing is a completion in the U.S. of an International Application or where the completion of the U.S. application contains subject matter in addition to the International Application, the application may be treated as a continuation or continuation-in-part, as the case may be, utilizing ADDED PAGE FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION CLAIMED.

☐ Application is made by a person authorized under 37 C.F.R. 1.41(c) on behalf of all the above named inventor(s).

(The declaration or oath, along with the surcharge required by 37 CFR 1.16(e) can be filed subsequently).

**NOTE:** It is important that all the correct inventor(s) are named for filing under 37 CFR 1.41(c) and 1.53(b).

☐ Showing that the filing is authorized.  
(not required unless called into question. 37 CFR 1.41(d))

## 6. Inventorship Statement

**WARNING:** If the named inventors are each not the inventors of all the claims an explanation, including the ownership of the various claims at the time the last claimed invention was made, should be submitted.

The inventorship for all the claims in this application are:

☒ The same.

or

☐ Not the same. An explanation, including the ownership of the various claims at the time the last claimed invention was made,

☐ is submitted.

☐ will be submitted.

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**7. Language**

**NOTE:** An application including a signed oath or declaration may be filed in a language other than English. An English translation of the non-English language application and the processing fee of \$130.00 required by 37 CFR 1.17(k) is required to be filed with the application, or within such time as may be set by the Office. 37 CFR 1.52(d).

☒ English

☐ Non-English

☐ The attached translation includes a statement that the translation is accurate. 37 C.F.R. 1.52(d).

**8. Assignment**

☒ An assignment of the invention to \_\_\_\_\_  
Continental Teves AG & Co. oHG

☒ is attached. A separate ☒ "COVER SHEET FOR ASSIGNMENT (DOCUMENT) ACCOMPANYING NEW PATENT APPLICATION" or ☐ FORM PTO 1595 is also attached.

☐ will follow.

**NOTE:** "If an assignment is submitted with a new application, send two separate letters—one for the application and one for the assignment." Notice of May 4, 1990 (1114 O.G. 77-78).

**WARNING:** A newly executed "CERTIFICATE UNDER 37 CFR 3.73(b)" must be filed when a continuation-in-part application is filed by an assignee. Notice of April 30, 1993, 1150 O.G. 62-64.

**9. Certified Copy**

Certified copy(ies) of application(s)

Country	Appln. No.	Filed
Country	Appln. No.	Filed
Country	Appln. No.	Filed

from which priority is claimed

☐ is (are) attached.

☐ will follow.

**NOTE:** The foreign application forming the basis for the claim for priority must be referred to in the oath or declaration. 37 CFR 1.55(a) and 1.63.

**NOTE:** This item is for any foreign priority for which the application being filed directly relates. If any parent U.S. application or International Application from which this application claims benefit under 35 U.S.C. 120 is itself entitled to priority from a prior foreign application, then complete item 18 on the ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED.

10. Fee Calculation (37 C.F.R. 1.16)

A. ☐ Regular application

CLAIMS AS FILED			
Number filed	Number Extra	Rate	Basic Fee 37 C.F.R. 1.16(a) \$790.00
Total Claims (37 CFR 1.16(c)) 7 - 20 =	×	\$ 22.00	
Independent Claims (37 CFR 1.16(b)) 2 - 3 =	×	\$ 82.00	
Multiple dependent claim(s), if any (37 CFR 1.16(d))	+	\$270.00	

- ☐ Amendment cancelling extra claims is enclosed.  
☐ Amendment deleting multiple-dependencies is enclosed.  
☐ Fee for extra claims is not being paid at this time.

NOTE: If the fees for extra claims are not paid on filing they must be paid or the claims cancelled by amendment, prior to the expiration of the time period set for response by the Patent and Trademark Office in any notice of fee deficiency. 37 CFR 1.16(d).

Filing Fee Calculation \$ 760.00

B. ☐ Design application  
(\$330.00—37 CFR 1.16(f))

Filing Fee Calculation \$

C. ☐ Plant application  
(\$540.00—37 CFR 1.16(g))

Filing fee calculation \$

11. Small Entity Statement(s)

- ☐ Statement(s) that this is a filing by a small entity under 37 CFR 1.9 and 1.27 is (are) attached.

**WARNING:** "Status as a small entity must be specifically established in each application or patent in which the status is available and desired. Status as a small entity in one application or patent does not affect any other application or patent, including applications or patents which are directly or indirectly dependent upon the application or patent in which the status has been established. The refiling of an application under § 1.53 as a continuation, division, or continuation-in-part (including a continued prosecution application under § 1.53(d)), or the filing of a reissue application requires a new determination as to continued entitlement to small entity status for the continuing or reissue application. A nonprovisional application claiming benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) of a prior application, or a reissue application may rely on a statement filed in the prior application or in the patent if the nonprovisional application or the reissue application includes a reference to the statement in the prior application or in the patent or includes a copy of the statement in the prior application or in the patent and status as a small entity is still proper and desired. The payment of the small entity basic statutory filing fee will be treated as such a reference for purposes of this section." 37 C.F.R. § 1.28(a)(2).

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(complete the following, if applicable)

- ☐ Status as a small entity was claimed in prior application  
 \_\_\_\_\_ / \_\_\_\_\_, filed on \_\_\_\_\_, from which benefit  
 is being claimed for this application under:

35 U.S.C. ☐ 119(e),  
☐ 120,  
☐ 121,  
☐ 365(c),

and which status as a small entity is still proper and desired.

- ☐ A copy of the statement in the prior application is included.

Filing Fee Calculation (50% of A, B or C above)

\$ \_\_\_\_\_

**NOTE:** Any excess of the full fee paid will be refunded if small entity status is established and a refund request  
 are filed within 2 months of the date of timely payment of a full fee. The two-month period is not  
 extendable under § 1.136. 37 CFR 1.28(a).

**12. Request for International-Type Search (37 C.F.R. 1.104(d))**

(complete, if applicable)

- ☐ Please prepare an international-type search report for this application at the time  
 when national examination on the merits takes place.

**13. Fee Payment Being Made at This Time**

- ☐ Not Enclosed

- ☐ No filing fee is to be paid at this time.  
*(This and the surcharge required by 37 C.F.R. 1.16(e) can be paid subse-*  
*quently.)*

- ☒ Enclosed

- ☒ Filing fee \$ 760.00
- ☐ Recording assignment  
 (\$40.00; 37 C.F.R. 1.21(h))  
 (See attached "COVER SHEET FOR  
 ASSIGNMENT ACCOMPANYING NEW  
 APPLICATION") \$ \_\_\_\_\_
- ☐ Petition fee for filing by other than all the  
 inventors or person on behalf of the inventor  
 where inventor refused to sign or cannot be  
 reached  
 (\$130.00; 37 C.F.R. 1.47 and 1.17(i)) \$ \_\_\_\_\_
- ☐ For processing an application with a  
 specification in  
 a non-English language  
 (\$130.00; 37 C.F.R. 1.52(d) and 1.17(k)) \$ \_\_\_\_\_
- ☐ Processing and retention fee  
 (\$130.00; 37 C.F.R. 1.53(d) and 1.21(l)) \$ \_\_\_\_\_
- ☐ Fee for international-type search report  
 (\$40.00; 37 C.F.R. 1.21(e)) \$ \_\_\_\_\_

NOTE: 37 CFR 1.21(f) establishes a fee for processing and retaining any application that is abandoned for failing to complete the application pursuant to 37 CFR 1.53(f) and this, as well as the changes to 37 CFR 1.53 and 1.78(a)(1), indicate that in order to obtain the benefit of a prior U.S. application, either the basic filing fee must be paid, or the processing and retention fee of § 1.21(f) must be paid, within 1 year from notification under § 53(f).

Total fees enclosed

\$ 760.00

#### 14. Method of Payment of Fees

- ☐ Check in the amount of \$ \_\_\_\_\_
- ☒ Charge Account No. 18-0013 in the amount of \$ 760.00

A duplicate of this transmittal is attached.

NOTE: Fees should be itemized in such a manner that it is clear for which purpose the fees are paid. 37 CFR 1.22(b).

#### 15. Authorization to Charge Additional Fees

**WARNING:** If no fees are to be paid on filing, the following items should not be completed.

**WARNING:** Accurately count claims, especially multiple dependent claims, to avoid unexpected high charges, if extra claim charges are authorized.

- ☒ The Commissioner is hereby authorized to charge the following additional fees by this paper and during the entire pendency of this application to Account No. 18-0013:

- ☒ 37 C.F.R. 1.16(a), (f) or (g) (filing fees)
- ☒ 37 C.F.R. 1.16(b), (c) and (d) (presentation of extra claims)

NOTE: Because additional fees for excess or multiple dependent claims not paid on filing or on later presentation must only be paid or these claims cancelled by amendment prior to the expiration of the time period set for response by the PTO in any notice of fee deficiency (37 CFR 1.16(d)), it might be best not to authorize the PTO to charge additional claim fees, except possibly when dealing with amendments after final action.

- ☒ 37 C.F.R. 1.16(e) (surcharge for filing the basic filing fee and/or declaration on a date later than the filing date of the application)
- ☒ 37 C.F.R. §§ 1.17(a)(1)-(5) (extension fees pursuant to § 1.136(a)).
- ☒ 37 C.F.R. 1.17 (application processing fees)

NOTE: ". . . A written request may be submitted in an application that is an authorization to treat any concurrent or future reply, requiring a petition for an extension of time under this paragraph for its timely submission, as incorporating a petition for extension of time for the appropriate length of time. An authorization to charge all required fees, fees under § 1.17, or all required extension of time fees will be treated as a constructive petition for an extension of time in any concurrent or future reply requiring a petition for an extension of time under this paragraph for its timely submission. Submission of the fee set forth in § 1.17(a) will also be treated as a constructive petition for an extension of time in any concurrent reply requiring a petition for an extension of time under this paragraph for its timely submission." 37 C.F.R. § 1.136(a)(3).

- ☐ 37 C.F.R. 1.18 (issue fee at or before mailing of Notice of Allowance, pursuant to 37 C.F.R. 1.311(b))

NOTE: Where an authorization to charge the issue fee to a deposit account has been filed before the mailing of a Notice of Allowance, the issue fee will be automatically charged to the deposit account at the time of mailing the notice of allowance. 37 CFR 1.311(b).

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**NOTE:** 37 CFR 1.28(b) requires "Notification of any change in status resulting in loss of entitlement to small entity status must be filed in the application . . . prior to paying, or at the time of paying, . . . issue fee." From the wording of 37 CFR 1.28(b), (a) notification of change of status must be made even if the fee is paid as "other than a small entity" and (b) no notification is required if the change is to another small entity.

**16. Instructions as to Overpayment**

**NOTE:** ". . . Amounts of twenty-five dollars or less will not be returned unless specifically requested within a reasonable time, nor will the payer be notified of such amounts; amounts over twenty-five dollars may be returned by check or, if requested, by credit to a deposit account." 37 C.F.R. § 1.26(a).


☒ Credit Account No. 18-0013

☐ Refund

Reg. No. 33373

Tel. No. (248) 594-0650

Customer No.

  
SIGNATURE OF PRACTITIONER

Joseph V. Coppola, Sr.

(type or print name of attorney)

Rader, Fishman & Grauer PLLC

P.O. Address

1533 N. Woodward Ave., Suite 140

Bloomfield Hills, MI 48304

☐ **Incorporation by reference of added pages**

*(check the following item if the application in this transmittal claims the benefit of prior U.S. application(s) (including an international application entering the U.S. stage as a continuation, divisional or C-I-P application) and complete and attach the ADDED PAGES FOR NEW APPLICATION TRANSMITTAL WHERE BENEFIT OF PRIOR U.S. APPLICATION(S) CLAIMED)*

- ☐ Plus Added Pages for New Application Transmittal Where Benefit of Prior U.S. Application(s) Claimed

Number of pages added \_\_\_\_\_

- ☐ Plus Added Pages for Papers Referred to in Item 4 Above

Number of pages added \_\_\_\_\_

- ☐ Plus added pages deleting names of inventor(s) named in prior application(s) who is/are no longer inventor(s) of the subject matter claimed in this application.

Number of pages added \_\_\_\_\_

- ☐ Plus "Assignment Cover Letter Accompanying New Application"

Number of pages added \_\_\_\_\_

☒ **Statement Where No Further Pages Added**

*(if no further pages form a part of this Transmittal, then end this Transmittal with this page and check the following item)*

- ☒ This transmittal ends with this page.

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RADER, FISHMAN AND GRAUER PLLC  
1533 N. WOODWARD AVENUE, SUITE 140  
BLOOMFIELD HILLS, MI 48304

UNITED STATES PATENT APPLICATION

of

**MICHAEL BAYER**

a citizen of Germany  
residing at 5039 Ona Lake Dr.  
White Lake, MI 48383

for new and useful invention entitled:

**ELECTRICAL CONNECTOR FOR CONNECTION BETWEEN COIL AND  
PRINTED CIRCUIT BOARD IN AUTOMOTIVE ANTI-LOCK BRAKING SYSTEM**

Joseph V. Coppola, Sr., Reg. No. 33,373  
Attorney Docket No. ATUS4630

**ELECTRICAL CONNECTOR FOR CONNECTION BETWEEN COIL AND**  
**PRINTED CIRCUIT BOARD IN AUTOMOTIVE ANTI-LOCK BRAKING**  
**SYSTEM**

5

**Field of the Invention**

The present invention relates to automotive anti-lock braking systems. More particularly, the present invention relates to electrical connectors for use in such automotive anti-lock braking systems.

10

**Background**

In an automotive anti-lock braking system (ABS), wheel-speed sensors monitor the motion of the wheels. If one of the wheels begins to lock, the peripheral wheel deceleration and wheel slip increase sharply. When these quantities exceed certain thresholds, a controller circuit, typically mounted on a printed circuit board (PCB), commands a solenoid-valve unit to stop or reduce the buildup of wheel-brake pressure until a lock up condition is no longer imminent. To alleviate pressure buildup, the solenoid rapidly actuates the brakes in a "pumping" action that causes the wheel-brake pressure to undergo a succession of buildup, reduction, and holding phases.

20

Inductive coils in the solenoid-valve unit are typically connected to the PCB by solder joints. The coils are connected to the valve block that houses the solenoid-valve unit through a mechanical interface. Various tolerances must be accommodated in conventional mechanical interfaces, increasing their design complexity and manufacturing cost.

### Summary of the Invention

A coil bobbin has one or more protruding stems wrapped with a pre-tinned portion of a coil wire, such that the pre-tinned portion contacts the through-holes of the printed circuit board (PCB) when the stems are inserted through them.

- 5    Sufficient interference between the through-holes and the connector creates a tin-tin type connection system. The design complexity of the connector is reduced, and the need to solder the connector to the PCB is eliminated.

- According to one embodiment, an electrical connector for establishing a solderless connection between a solenoid wire coil and a printed circuit board for  
10    use in an automotive anti-lock braking system includes a coil bobbin having at least one stem extending from a first surface thereof. A wire is wound in a coil arrangement around the coil bobbin and has a pre-tinned portion disposed over a distal end of the at least one stem.

- In another embodiment, the electrical connector comprises a coil  
15    bobbin having a plurality of plastic stems extending from a first surface thereof. A wire is wound in a coil arrangement around the coil bobbin and has pre-tinned portions disposed over distal ends of each of the plastic stems. A secondary bobbin is formed over the wire, and a multi-lip wire seal is formed over the secondary bobbin for sealing the wire.

- 20    The above summary of the present invention is not intended to describe each illustrated embodiment or every implementation of the present invention. The figures and the detailed description that follow more particularly exemplify these embodiments.

### **Brief Description of the Drawings**

These and other aspects and advantages of the present invention will become apparent upon reading the following detailed description and upon reference to the drawings, in which:

5                   FIG. 1 illustrates an example electrical connector for connecting a solenoid coil to a printed circuit board, according to an embodiment of the present invention;

FIG. 2 is a magnified view of a portion of the electrical connector depicted in FIG. 1; and

10                   FIG. 3 is a cross-sectional view of a portion of the electrical connector depicted in FIGS. 1 and 2.

The invention is amenable to various modifications and alternative forms. Specifics thereof have been shown by way of example in the drawings and will be described in detail. It should be understood, however, that the intention is not to limit the invention to the particular embodiments described. On the contrary, the  
15                   intention is to cover all modifications, equivalents, and alternatives falling within the spirit and scope of the invention as defined by the appended claims.

### **Detailed Description**

20                   The present invention is applicable to a variety of automotive anti-lock braking (ABS) systems. The invention has been found to be particularly advantageous in environments in which a simple interface between a solenoid coil and control circuitry disposed on a printed circuit board (PCB) is desirable. An

appreciation of various aspects of the invention can be gained through a discussion of various application examples operating in such environments.

According to one embodiment of the present invention, a coil bobbin has one or more protruding stems wrapped with a pre-tinned coil wire. The coil wire  
5 contacts the through-hole of the PCB. Sufficient interference between the through-hole and the connector creates a tin-tin type connection system. The design complexity of the connector is reduced, and the need to solder the connector to the PCB is eliminated.

Referring now to the figures, FIG. 1 depicts an example electrical  
10 connector 100 for connecting the solenoid coil to the PCB, according to a particular embodiment of the present invention. A coil bobbin 102 provides the main structure for the connector 100. A coil wire 104 is wrapped around the coil bobbin 102. A portion of the coil wire 104 is pre-tinned and passes through holes 106 in the top surface of the coil bobbin 102. The pre-tinned portion is then wrapped over plastic  
15 stems 108 that protrude from the top of the coil bobbin 102.

One of the plastic stems 108 is illustrated in greater detail in FIG. 2 and in cross-sectional view in FIG. 3. The plastic stem 108 has an end portion 110 over which a pre-tinned portion 112 of the coil wire 104 of FIG. 1 is wrapped. FIG. 2 shows this end portion 110 inserted through a plated through-hole of a PCB 114.  
20 Wrapping the pre-tinned portion 112 of the coil wire 104 over the end portion 110 allows a connection to be established between the coil wire 104 and the PCB 114 when the end portion 110 of the plastic stem 108 is inserted through the through-hole. According to a particular implementation, an optional secondary bobbin 116 is molded over the coil wire 104 and the coil bobbin 102. An optional multi-lip wire

seal 118 is then formed over the secondary bobbin 116 to seal the coil wire 104 from the plastic electronic control module housing. Alternatively, the coil wire 104 can be sealed using a different technique, such as, for example, an O-ring or silica gel.

By wrapping the coil wire over the plastic stem as described above, a  
5 connection can be established between the coil wire and the PCB without soldering. As a result, the interface between the coil and the solenoid valve block is simplified, reducing manufacturing costs.

The various embodiments described above are provided by way of illustration only and should not be construed to limit the invention. Those skilled in  
10 the art will readily recognize various modifications and changes that can be made to these embodiments without strictly following the example embodiments and applications illustrated and described herein, and without departing from the true spirit and scope of the present invention, which is set forth in the following claims.



**What is claimed is:**

1                   1.       For use in an automotive anti-lock braking system, an electrical  
2 connector for establishing a solderless connection between a solenoid wire coil and a  
3 printed circuit board, the electrical connector comprising:

4                   a coil bobbin having at least one stem extending from a first surface  
5 thereof; and

6                   a wire wound in a coil arrangement around the coil bobbin and having  
7 a pre-tinned portion disposed over a distal end of the at least one stem.

1                   2.       An electrical connector, according to claim 1, wherein the pre-  
2 tinned portion of the wire passes through a hole defined by the first surface of the coil  
3 bobbin.

1                   3.       An electrical connector, according to claim 1, wherein the at  
2 least one stem is formed from plastic.

1                   4.       An electrical connector, according to claim 1, further  
2 comprising a secondary bobbin formed over the wire.

1                   5.       An electrical connector, according to claim 4, further  
2 comprising a multi-lip wire seal formed over the secondary bobbin for sealing the  
3 wire.

1                   6.       An electrical connector, according to claim 1, wherein the wire  
2 is sealed using at least one of an O-ring and silica gel.

1                    7.     For use in an automotive anti-lock braking system, an electrical  
2     connector for establishing a solderless connection between a solenoid wire coil and a  
3     printed circuit board, the electrical connector comprising:  
4                    a coil bobbin having a plurality of plastic stems extending from a first  
5     surface thereof;  
6                    a wire wound in a coil arrangement around the coil bobbin and having  
7     pre-tinned portions disposed over distal ends of each of the plurality of plastic stems;  
8                    a secondary bobbin formed over the wire; and  
9                    a multi-lip wire seal formed over the secondary bobbin for sealing the  
10    wire.

## ABSTRACT

An electrical connector for connecting a solenoid wire coil to a printed circuit board in an automotive anti-lock braking system has a coil bobbin, around which the wire coil is wound. The wire coil has pre-tinned sections that are wrapped  
5 over pins protruding from the coil bobbin. When the pins are inserted in through-holes of the printed circuit board, the pre-tinned sections contact the through-holes, establishing a connection between the solenoid coil wire and the printed circuit board without soldering.

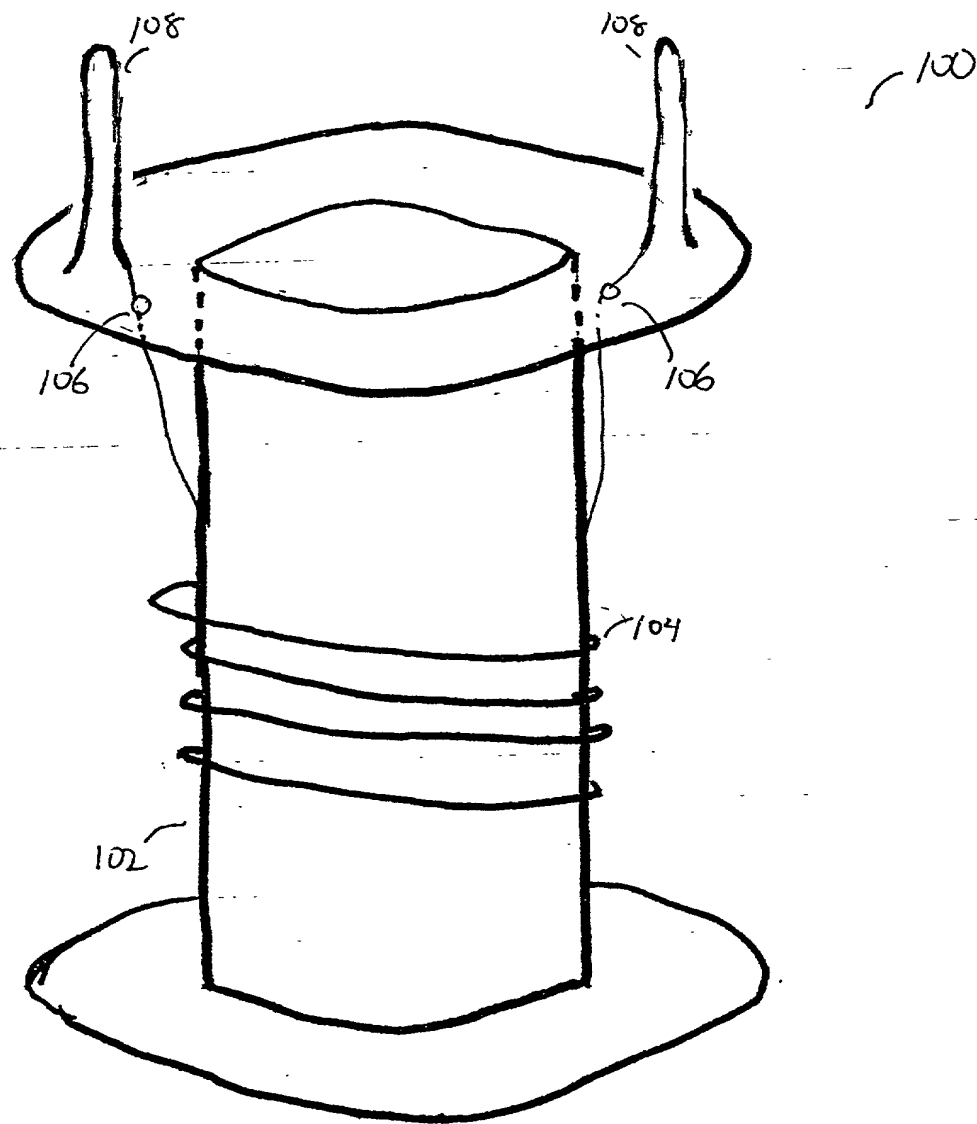


Fig. 1

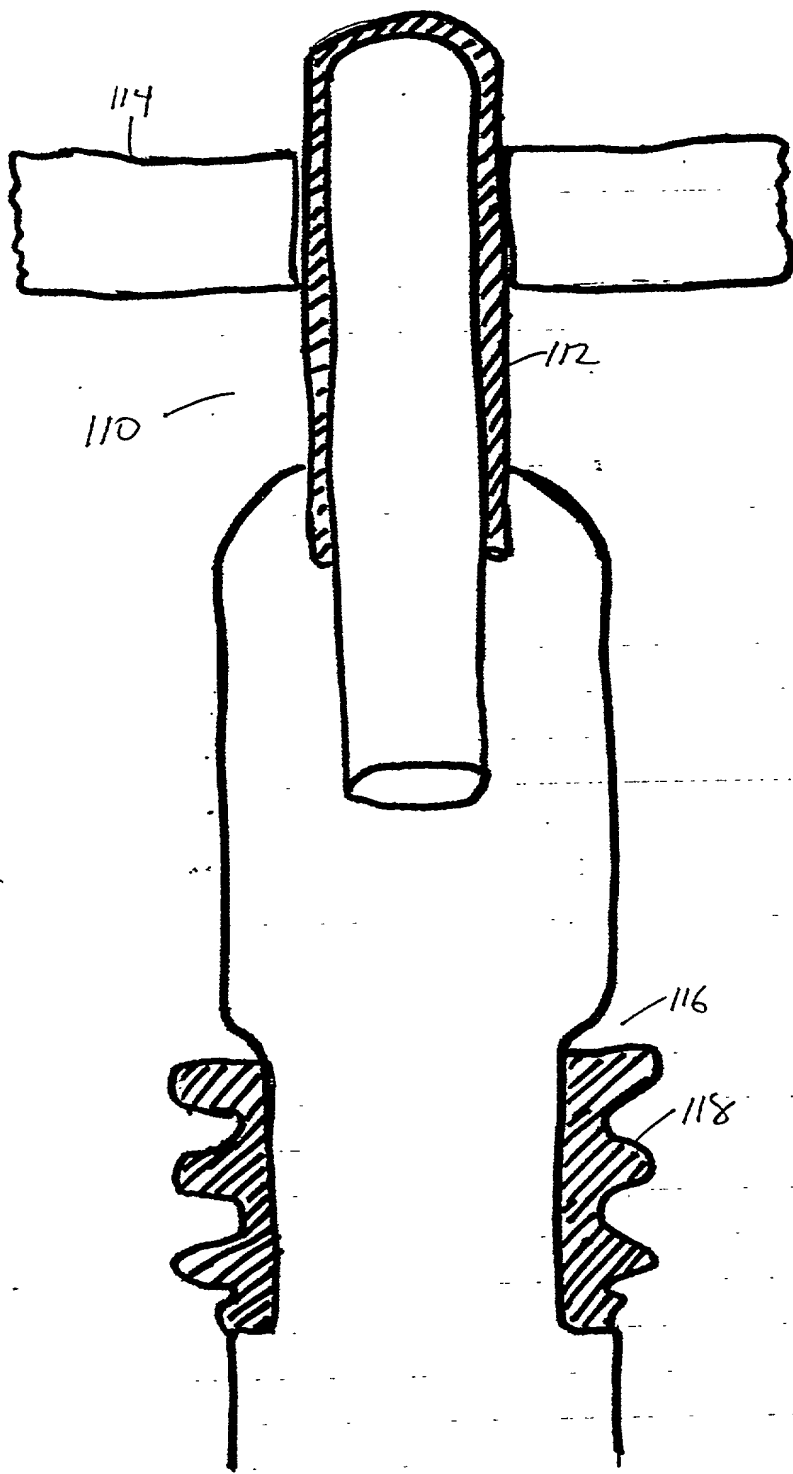


Fig. 2

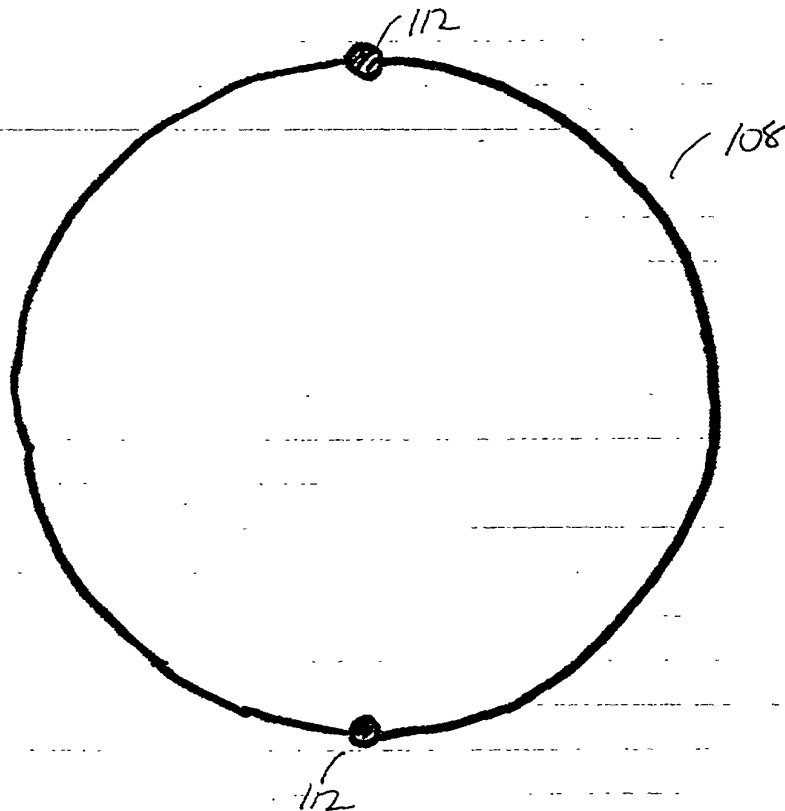


Fig. 3

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	<b>First Named Inventor</b>		Michael Bayer																																											
	<b>COMPLETE IF KNOWN</b>																																													
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<p>As a below named inventor, I hereby declare that:</p> <p>My residence, post office address, and citizenship are as stated below next to my name.</p> <p>I believe I am the original, first and sole inventor (only if one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:</p> <div style="border: 1px solid black; padding: 5px; text-align: center;"><p><b>ELECTRICAL CONNECTOR FOR CONNECTION BETWEEN COIL AND PRINTED CIRCUIT BOARD IN AUTOMOTIVE ANTI-LOCK BRAKING SYSTEM</b></p><p><i>(Title of the Invention)</i></p></div> <p>the specification of which</p> <div style="display: flex; align-items: flex-start;"><div style="margin-right: 10px;"><input checked="" type="checkbox"/> is attached hereto or <input type="checkbox"/> was filed on _____, as United States Application Number or PCT International Application Number: _____ and was amended on _____ (if applicable).</div></div> <p>I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment specifically referred to above.</p> <p>I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations § 1.56.</p> <p>I hereby claim foreign priority benefits under Title 35, United States Code §119 (a)-(d) of any foreign application(s) for patent or inventor's certificate, or § 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or of any PCT international application having a filing date before that of the application on which priority is claimed.</p> <table border="1" style="width: 100%; border-collapse: collapse;"><thead><tr><th rowspan="2">Prior Foreign Application Number(s)</th><th rowspan="2">Country</th><th rowspan="2">Foreign Filing Date (MM/DD/YY)</th><th rowspan="2">Priority Not Claimed</th><th colspan="2">Certified Copy Attached</th></tr><tr><th>YES</th><th>NO</th></tr></thead><tbody><tr><td> </td><td> </td><td> </td><td> </td><td><input type="checkbox"/></td><td><input type="checkbox"/></td></tr><tr><td> </td><td> </td><td> </td><td> </td><td><input type="checkbox"/></td><td><input type="checkbox"/></td></tr><tr><td> </td><td> </td><td> </td><td> </td><td><input type="checkbox"/></td><td><input type="checkbox"/></td></tr></tbody></table> <div style="display: flex; align-items: flex-start;"><div><input type="checkbox"/> Additional foreign application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto:</div></div> <p>I hereby claim the benefit under Title 35, United States Code §119(e) of any United States provisional application(s) listed below.</p> <table border="1" style="width: 100%; border-collapse: collapse;"><thead><tr><th>Application Number (s)</th><th>Filing Date (MM/DD/YY)</th><th rowspan="7"><input type="checkbox"/> Additional provisional application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.</th></tr></thead><tbody><tr><td> </td><td> </td></tr><tr><td> </td><td> </td></tr><tr><td> </td><td> </td></tr><tr><td> </td><td> </td></tr><tr><td> </td><td> </td></tr><tr><td> </td><td> </td></tr></tbody></table>						Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YY)	Priority Not Claimed	Certified Copy Attached		YES	NO					<input type="checkbox"/>	<input type="checkbox"/>					<input type="checkbox"/>	<input type="checkbox"/>					<input type="checkbox"/>	<input type="checkbox"/>	Application Number (s)	Filing Date (MM/DD/YY)	<input type="checkbox"/> Additional provisional application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.												
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U.S Parent Application Number	PCT Parent Number	Parent Filing Date (MM/DD/YYYY)	Parent Patent Number (if applicable)

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<b>Name of Sole or First Inventor</b>		<input type="checkbox"/> A petition has been filed for this unsigned inventor			
Given Name (first and middle [if any])		Family Name or Surname			
Michael		BAYER			
<b>Inventor's Signature</b>				<b>Dated</b>	
				12/11/1988	
<b>Residence: City</b>	White Lake	<b>State</b>	MI	<b>Country</b>	USA
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<b>Country</b>	USA				

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<b>Inventor's Signature</b>				<b>Dated</b>	
<b>Residence: City</b>		<b>State</b>		<b>Country</b>	
<b>Post Office Address</b>					